1.) $y' = y^2 + 4$ $|t| < \pi/4$ 1.2

$y = 2\tan 2t$

$y' = 4\sec^2 2t$ $\sec^2 x = \tan^2 x + 1$

$4\sec^2 2t = 4\tan^2 2t + 4$

$\sec^2 2t = \tan^2 2t + 1$

$\tan^2 2t + 1 = \tan^2 2t + 1$ ✓ ✓

3.) $y' = \frac{2y}{t} + t$ $t > 0$

$y = t^2 \ln t$

$y' = t^2 \cdot \frac{1}{t} + 2t \ln t$

$y' = t + 2t \ln t$

$t + 2t \ln t = \frac{2y}{t} + t$

$t + 2t \ln t = 2t \ln t + t$ ✓ ✓

7.) $y = ce^{t^2}$

$y' = 2ty$ $y(0) = 2$

$y' = 2t \cdot ce^{t^2}$

$2t \cdot ce^{t^2} = 2t \cdot ce^{t^2}$

$2 = ce^{0^2}$

$2 = c \cdot 1$ $c = 2$

$c = 2$

53.) $y'' - y' - 2y = 0$

a.) $y = e^{2t}$ $y = e^{-t}$

$y' = 2e^{2t}$ $4e^{2t} - 2e^{2t} - 2e^{2t} = 0$

$y'' = 4e^{2t}$ $0 = 0$

$y = e^{2t}$ ✓ $e^{-t} + e^{-t} - 2e^{-t} = 0$

$y' = -e^{-t}$ $0 = 0$

$y'' = e^{-t}$

$y = e^{-t}$ ✓

b.) $y = Ae^{2t}$ $y = e^{2t} + e^{-t}$

$y' = 2Ae^{2t}$

$y'' = 4Ae^{2t}$ $4Ae^{2t} - 2Ae^{2t} - 2Ae^{2t} = 0$

$0 = 0$

$y = Ae^{2t}$ ✓ $4e^{2t} + e^{-t} - 2e^{2t} + e^{-t} - 2e^{2t} - 2e^{-t} = 0$

$y' = 2e^{2t} - e^{-t}$ $0 = 0$

$y'' = 4e^{2t} + e^{-t}$

$y = e^{2t} + e^{-t}$ ✓

c.) $y = Ae^{2t} + Be^{-t}$

$y' = 2Ae^{2t} - Be^{-t}$ ~~$4Ae^{2t} + Be^{-t} - 2Ae^{2t} + Be^{-t} - 2Ae^{2t} - 2Be^{2t} = 0$~~

$y'' = 4Ae^{2t} + Be^{-t}$ $0 = 0$

$2y = 2Ae^{2t} + 2Be^{-t}$

$y = Ae^{2t} + Be^{-t}$ ✓

D.) $y(0)=2$ $y'(0)=-5$

$2=Ae^0+Be^0$ $-5=2Ae^0-Be^0$ $A=-1$

$2=A+B$ $-5=2A-B$ $B=3$

$2=A+B$ $2=-1+B$

$-5=2A-B$ $3=B$

$-3=3A$

$A=-1$

$B=3$